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EDITORIALS

The Clinical Significance of Protein

The important role of protein nutrition in medicine has been stressed in abundant clinical and experimental reports. Although they are related to protein intake, we will not consider here the roles of fluid and electrolyte balance and vitamin intake, but rather of protein per se.

Proteins, whether derived from animal or vegetable sources, are designated as "complete" if they contain those amino acids which the body is unable to synthesize. Optimal nutrition, as far as protein intake is concerned, is usually considered to be one gram per kilogram of body weight per day for adults, and three to four times that amount for infants and children. All ingested protein is split by the pancreatic enzymes into polypeptides and ultimately into amino acids—in which form they enter the portal blood. The amino acids may be converted to carbohydrates, or may be used as building blocks for the formation of body or plasma proteins. The liver plays a dominant role in these processes. All nitrogen excreted by the kidneys is from either this ingested (or exogenous) protein, or the breakdown of body (or endogenous) protein. Nitrogen loss in the stools is highly constant in health. In disease protein may be lost in the urine, from the surface of burns, or areas of suppuration. An individual is in nitrogen balance only if his nitrogen (i.e., protein) intake is equal to the total nitrogen loss from all routes. If nitrogen loss exceeds the intake, the inference is inescapable that tissue proteins are being destroyed to meet the demands and the person is in "negative" nitrogen balance.

A clinical suspicion of protein deficiency may be obtained by scrutiny of the patient's dietary history, both as to protein and caloric content, for if the latter is inadequate body proteins are burned to furnish energy and loss of weight will result. If a decrease in plasma proteins is detected gross protein deficiency is present. In this connection we should recall that Elman[7] has calculated that in an adult of 70 kilograms for each gram per cent that plasma proteins decrease, a total body loss of fully one thousand grams has occurred.

Protein deficiency may result from inadequate intake (as in famine); inadequate absorption (as in chronic diarrhea or absence of pancreatic ferments); or inadequate utilization (as in cirrhosis of the liver). The heightened metabolism of fever or hyperthyroidism increases the need for protein as does the developing fetus in pregnant women. Excessive loss may be occasioned by the exudate of severe burns or infected wounds, or the albuminurea of nephrosis.

A few specific illustrations may make these generalities more vivid. Excessive urinary nitrogen loss representing a negative balance of 50-150 gm. of body protein per day may follow with fractures,[5] burns,[8] or relatively simple surgical procedures. Gastrointestinal surgery results in an added strain on protein stores because of the patient's inability to assimilate food. Wounds heal less rapidly when hypoproteinemia is thus allowed to develop[9] and this lack of satisfactory repair likewise involves, of course, internal suture lines such as at the site of gastrointestinal anastomoses.

In non-surgical realms, the anemia of pregnancy is frequently accentuated by protein lack,[2] hypoproteinemia is present in a major portion of patients with severe thyrotoxicosis[1] and in patients with cirrhosis of the liver. Peptic ulcers are reported to be more readily healed by feedings of a protein digest, rather than the traditional Sippy regime.[4] Here, however, we should recall that many other factors are present in the complicated ulcer problem. In stenosing duodenal ulcer, with associated anorexia or frank vomiting, plasma proteins are soon distinctly lowered. The prompt utilization of small frequent feed-

ings of a protein digest, may correct the hypoproteinemia and hence tend to relieve the element of edema which is present at the scarred pylorus.

Whether an oral or parenteral protein is given will obviously depend on the nature of the disease, the magnitude of the deficiency, and the urgency of promptly meeting the protein deficit. The amino acids now available for protein therapy are derived from either the enzymatic or acid hydrolysis of casein, lactalbumins, or pancreas. Tryptophane is added to the products obtained by acid hydrolysis to render them complete. The oral preparations are palatable and the parenteral solutions so purified that reactions from their intravenous use is infrequent. The more concentrated oral products range in protein content from 70 per cent to 90 per cent. In general, when a case demands sustained parenteral glucose for nutrition it will prove desirable to give 5 per cent hydrolysates intravenously as well. In patients with vomiting, pronounced diarrhea, or enteric fistulae, parenteral amino acid therapy will be necessary. However, unless pain, toxemia or anorexia prevent an adequate intake, oral therapy will suffice in most all other instances. As much as 300 gm. of protein may be taken by mouth and assimilated readily. These oral preparations are fully acceptable to the patient in milk, fruit juices, or soup and serve as ideal supplements to the usual "high protein" hospital diet.

Plasma may be administered in protein deficiency, but its major use in connection with shock is not pertinent to this discussion. However, it should be re-emphasized that mere protein therapy must be complemented by full attention to other nutritional needs.

The integrity of the liver is paramount in the ultimate utilization of proteins no matter by what route they are administered. Thus in severe hepatic cirrhosis high protein diets usually fail to significantly elevate the plasma level. Conversely, the liver is more prone to be damaged by poisons, as chloroform,[6] when deficient in protein.

Many further points of clinical interest will surely be forthcoming in this field. One deserving mention is the work of Cannon[3] which indicates that antibody formation is less active in persistent protein deficiency. The demonstration of the inter-relationship of these many facets of protein nutrition will continue to be an exciting and important sphere of clinical and experimental investigation.

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Penicillin Treatment of Resistant Subacute Bacterial Endocarditis

Subacute bacterial endocarditis caused by nonhemolytic streptococci of various types has been a uniformly fatal disease. Recent investigation has demonstrated that the infectious process can be eradicated in nearly all cases of this disease if penicillin is administered in sufficient amounts and for an adequate length of time.[1,2,7]

It is now generally agreed that uninterrupted treatment for not less than four and preferably for six to eight weeks is necessary if optimum results are to be obtained.[1,6] Penicillin may be administered in such cases continuously by the intravenous or intramuscular route.[5] Equally and, perhaps, more satisfactory clinical results are obtained if the drug is injected intramuscularly at three-hour intervals.[4] This technique is much more simple and usually preferred by the patient.

The amount of penicillin which must be given during each 24-hour period is less clearly defined. In general, there is a rough correlation between the concentration of penicillin necessary for the complete inhibition of the infectious agent *in vitro* and the required daily dose. The streptococci isolated from the majority of cases of subacute bacterial endocarditis are inhibited by 0.1 unit of penicillin per ml.[3] Under these circumstances the daily administration of 300,000 units of penicillin will usually be adequate for the elimination of the infection.[1]

If the infecting streptococcus is more resistant larger amounts of penicillin must be used. No definite recommendations may be made at this time as to the minimum dosage which will be effective with organisms of increasing degrees of penicillin resistance. Each case must be managed individually. The initial daily dose should be 500,-